OsteoArthritis and Cartilage (2006) **14,** 1288–1293

doi:10.1016/j.joca.2006.06.003

Osteoarthritis and Cartilage

International Cartilage Repair Society

OARSI OSTEOARTHRITIS RESEARCH SOCIETY INTERNATIONAL

Prevalence of and factors associated with glucosamine use in Canada

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Summary

Objective: Glucosamine is commonly used for the treatment of osteoarthritis, and its use is increasing in the general population. The Canadian Multicentre Osteoporosis Study (CaMos) provided an opportunity to examine the prevalence of glucosamine use across age and gender groups, and to assess the factors associated with its use.

Method: CaMos is a random, population-based sample of 9423 Canadians. Baseline assessments took place in 1996–1997 and the 5-year follow-up assessments in 2001–2002. The primary outcome of this analysis was glucosamine use at year 5. Prevalence estimates were age- and sex-standardized to the Canadian population. A number of factors potentially associated with glucosamine use were identified from the literature. Multivariable logistic regression was used to identify variables associated with glucosamine use.

Results: At 5 years, complete data were available for 7652 of the original 9423 participants (81.2%). For men, glucosamine use increased from 0.9% to 4.7% (weighted values), and for women, it increased from 1.3% to 8.2%. Glucosamine use was higher among older participants, those living in western Canada, and those with arthritis, back pain, higher calcium intake from supplements, physical activity and prior glucosamine use.

Conclusions: Glucosamine use increased substantially over 5 years, and its use is associated with a number of factors. Some may use glucosamine to manage pain and symptoms of arthritis and back pain, while others use it as a preventive measure to maintain health.

Key words: Glucosamine, Complementary and alternative medicine, CAMs, Prevalence.

Introduction

Complementary and alternative medicine (CAM) refers to a diverse group of therapies not considered to be a part of conventional medicine. CAM falls into four general categories, including alternative medical systems such as acupuncture and naturopathy; biologically based therapies (BBT) such as certain diets, supplements and megavitamin therapy; manipulative and body-based therapies such as chiropractic care and massage; and mind-body therapies such as prayer, meditation and yoga[1]. These therapies are used as a substitute for or in conjunction with conventional medicine, and their use is at an all-time high[1], particularly among those over 50 years of age[2].

Data from 2002 indicate that 62% of American adults had used some form of CAM in the previous 12 months[1]. Canadian data from the same year suggest that the rate of supplement use is similar in Canada and the US[3], while data from 2005 suggest that 71% of those surveyed had used a natural health product (NHP) at some time in their life[4]. NHPs are similar to the BBT category of CAM and include products such as vitamins and minerals, herbal remedies or plant extracts, homeopathic and traditional medicines, amino acids and essential fatty acids[4].

According to the National Health Interview Survey, use of CAM is higher for those who report a diagnosis of arthritis (41.1%) as compared to those without arthritis (34.6%), with nonvitamin, nonmineral products cited as the most frequently used (20.1%)[5]. A random sample of 612 primary care patients with arthritis or fibromyalgia found that 90.2% reported CAM use for arthritis at some point, with 34.1% reporting current use of oral supplements, mainly glucosamine and chondroitin[6].

Use of glucosamine compounds in the management of osteoarthritis has attracted a great deal of attention,

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Received 1 February 2006; revision accepted 5 June 2006.

primarily in the lay press, and to a lesser extent in the scientific community[7]. In 2002, glucosamine was one of the top five natural products used in the US general population, being used by approximately 14% of those who reported using an herbal or other natural product (other than vitamins or minerals) in the past 12 months[1]. In a 5-year retrospective study of 22 supplements purchased by an elderly cohort, glucosamine was identified as the most frequently used nonvitamin, nonmineral supplement[8].

Non-steroidal anti-inflammatory drugs remain the treatment of choice for pharmacological management of arthritis, but there are side effects to these treatments, and as a result, patients have looked to CAM and particularly glucosamine-containing products as an alternative[7,9]. Athletes at all ages and levels of participation have also embraced glucosamine as a treatment for arthritis, pain and swelling associated with injury[10]. Efficacy data have shown promising results[9,11,12], although a recent Cochrane Review suggests that the effectiveness may depend on the outcome measured and the brand of glucosamine used[7]. They noted that pooled results from studies using the Rotta preparation found glucosamine to be superior to placebo in the treatment of pain and functional impairment, while studies using a non-Rotta preparation failed to show a benefit in pain and function. Neither was superior to placebo when the outcome was the Western Ontario and MacMaster Osteoarthritis Index (WOMAC[13]). In addition, the Glucosamine/chondroitin Arthritis Intervention Trial (GAIT) was also unable to find conclusive evidence of efficacy[14,15].

Despite ongoing questions regarding effectiveness, glucosamine is commonly believed to be useful for the treatment of osteoarthritis, and its use is increasing in the general population[2,14]. The Canadian Multicentre Osteoporosis Study (CaMos), a random, population-based sample of 9423 Canadians, provided an opportunity to examine the prevalence of glucosamine use across age and gender groups, and to assess the factors associated with its use.

Methods

CaMos is an ongoing, prospective cohort study of 9423 non-institutionalized, randomly selected men and women aged 25 years and older at baseline, drawn from a 50-km radius of nine Canadian cities (St John's, Newfoundland; Halifax, Nova Scotia; Quebec City, Quebec; Toronto, Ontario; Hamilton, Ontario; Kingston, Ontario; Saskatoon, Saskatchewan; Calgary, Alberta; and Vancouver, British Columbia). Baseline assessments took place between February 1996 and September 1997 and the 5-year follow-up assessments between February 2001 and September 2002. Ethics approval was obtained through the Review Boards of each participating center.

A detailed description of the objectives, methodology and sampling framework for CaMos is available elsewhere[16]. Briefly, households within each region were selected by random draws of listed telephone numbers, and one randomly selected household member $\geq$25 years of age was asked to participate in the study. Participation involved a detailed, in-person interview at baseline, which was conducted by CaMos staff who received centralized training in interview techniques and the administration of the standardized questionnaires. The interview covered sociodemographic factors, medical and family history, food intake and lifestyle questions. Participants were also asked to bring with them all medications and supplements currently taken. They completed a short questionnaire annually thereafter, and returned for a full interview at 5 years.

CaMos was designed to collect epidemiological data related to the incidence and prevalence of osteoporosis. As a result, the sampling framework, although random, was designed to include more women than men, and higher numbers of older compared to younger Canadian residents. Our prevalence estimates were therefore age- and sex-standardized using simple direct standardization to the Canadian population, using Statistics Canada data from 2002. In order to project our rates across all of Canada, centers represented not only their city but also their province or region. For example, Halifax represented most of Atlantic Canada, including Nova Scotia, Prince Edward Island and New Brunswick, while Kingston represented only a small proportion of Ontario residents since Hamilton and Toronto were also included in the sample.

The primary outcome was glucosamine use, as reported at year 5. Participants were considered as positive for glucosamine use if they took glucosamine sulfate or glucosamine hydrochloride alone or in any preparation that listed glucosamine as one of the ingredients. All glucosamine products were available without a prescription. Length of time that the product was taken was not asked, but in order to be considered positive, it had to be taken on a regular basis. Factors potentially associated with glucosamine use were identified on the basis of a review of the existing literature and clinical input. These included age, gender, center, arthritis, osteoporosis, family history of arthritis, history of fracture, education level, history of back pain, body mass index (BMI, based on measured height and weight), use of calcium from supplements, time spent walking (typical week in the past 6 months), participation in regular activity (any regular activity or program), overall activity level (as compared to peers) and glucosamine use at baseline[1,2,4–7,10,17].

The independent variables included a combination of those assessed at baseline (e.g., center, gender, education level, and baseline glucosamine use) and at year 5 (e.g., activity level, BMI, and calcium from supplements). Conditions that could change during the 5-year follow-up, including arthritis, osteoporosis and fracture, were categorized as "no", "yes at baseline" and "yes developed since then" as their development over time could impact on glucosamine use. Rheumatoid arthritis and osteoarthritis were based on self-report, within the context of a clinical diagnosis ("Has a doctor ever told you that you have…"). However, participants were not always clear as to which they had, so these two were combined for this analysis. Back pain (yes/no) was also based on the participants' response as to whether they had ever experienced it. Calcium intake was measured in milligrams, on the basis of intake from supplements, and was analyzed overall and by 300-mg increments (the equivalent of the calcium in a serving of milk). Race and ethnicity were considered, but 94.9% of the sample were described as "white", resulting in insufficient numbers of other groups for accurate comparisons.

Descriptive statistics were generated by gender and for each of six age strata, beginning with 30–39 years and ending with 80 years and over. Participants were 25 years and older at baseline, but were 30 years and older at the time of the 5-year follow-up. The association between each variable and glucosamine use was examined using univariate logistic regression. Interactions between the variables were not tested. Multivariable logistic regression modeling was used to assess the effects of the independent variables on glucosamine use. The Bayes Information Criteria (BIC) model selection criterion[18] was used for model

selection. The BIC provides approximate Bayes factors, which are then used to compare how well the data fit each model.

Results

Complete data were available for 5430 of the original 6539 women (83.0%) and for 2222 of the original 2884 men (77.0%). Data were missing for 1771 (18.8%) participants for the following reasons: 644 (6.8%) had died by the time of follow-up; 429 (4.6%) completed a short questionnaire over the telephone rather than returning for a full interview; 260 (2.8%) could not be contacted; 117 (1.2%) were no longer interested; 98 (1.0%) were too sick; 123 (1.3%) had moved away; and 100 (1.1%) cited miscellaneous reasons such as canceled, no time or no reason given.

At baseline, 151 participants (34 or 1.2% of the men, 117 or 1.8% of the women) were taking glucosamine. Of these, 59 (39.1%) were still taking it at year 5, 64 (42.2%) had stopped taking it, and 28 (18.5%) did not have complete data at year 5 for a variety of reasons including death (10), a short telephone questionnaire only (12), too sick (2), and single cases of telephone number changed, no longer interested, moved away, and no time.

Table I contains the unadjusted frequencies for the sample characteristics, by gender. A much larger percentage of participants used glucosamine at year 5 as compared to baseline. For men, unadjusted glucosamine use increased from 1.2% at baseline to 8.5% at year 5 (weighted values were 0.9% to 4.7%), and for women, it increased from 1.8% to 12.8% (weighted values were 1.3% to 8.2%). Table II contains the weighted percentages of men and women using glucosamine at year 5, within each age group, center and by education level. There was an increase in glucosamine use with increased age for both men and women. Glucosamine use was somewhat higher in the western centers of Saskatoon, Calgary and particularly Vancouver as compared to the Atlantic, Quebec and the three Ontario centers. Use was somewhat higher in men with more education than in those at lower levels of education. The opposite was true for women, with greater use at the lower levels of education.

When examining the weighted values for BMI, men using glucosamine had a lower mean BMI (26.8 ± 3.0) than those who did not (27.3 ± 5.2). This was reversed for women, where those who were taking glucosamine had a higher mean BMI (27.6 ± 3.8) than those who were not (26.3 ± 5.0). In addition, men taking glucosamine had a higher weighted mean calcium intake from supplements (278.8 ± 410.3 mg) than those who did not (116.4 ± 394.7 mg), which also held true for women, at 567.9 ± 321.8 mg for those taking glucosamine and 305.0 ± 388.9 for those who did not.

Table III provides the percentages of participants with arthritis, osteoporosis, family history of arthritis, history of fracture and history of back pain, as well as the percentages using glucosamine within each response category. For three of these (arthritis, osteoporosis and fracture), data are presented separately for those who had the condition at baseline or developed it since that time. Glucosamine

Table I
Unadjusted frequencies for sample characteristics

Characteristic	Unadjusted frequencies *n* (%)	
	Male	Female
Sample size*		
Year 5	2222 (100)	5430 (100)
Glucosamine use		
Baseline	34 (1.2)	117 (1.8)
Year 5	189 (8.5)	694 (12.8)
Age group in years		
30–39	149 (6.7)	168 (3.1)
40–49	175 (7.9)	261 (4.8)
50–59	486 (21.9)	1023 (18.8)
60–69	553 (24.9)	1454 (26.8)
70–79	626 (28.2)	1774 (32.7)
80+	233 (10.5)	750 (13.8)
Center		
St. John's, Newfoundland	210 (9.5)	591 (10.9)
Halifax, Nova Scotia	239 (10.8)	597 (11.0)
Quebec City, Quebec	257 (11.6)	668 (12.3)
Kingston, Ontario	236 (10.6)	607 (11.2)
Toronto, Ontario	217 (9.8)	480 (8.8)
Hamilton, Ontario	263 (11.8)	631 (11.6)
Saskatoon, Saskatchewan	278 (12.5)	632 (11.6)
Calgary, Alberta	267 (12.0)	614 (11.3)
Vancouver, British Columbia	255 (11.5)	610 (11.2)
Education†		
<Grade 9	220 (9.9)	634 (11.7)
Grade 9–13, No Diploma	448 (20.2)	1354 (24.9)
High School Diploma	288 (13.0)	850 (15.7)
Trade/Professional Diploma	398 (17.9)	1210 (22.3)
University without Diploma	183 (8.2)	392 (7.2)
University with Diploma	100 (4.5)	262 (4.8)
University Degree(s)	585 (26.3)	728 (13.4)

*At baseline, $N = 2884$ men and 6539 women.

†For Education, all references to a diploma were collected as "Certificate or Diploma".

Table II
Glucosamine use at year 5, using values standardized to the Canadian population. Percentages reflect the number of users within each age group, Center or education level

Characteristic	Percent and 95% CI	
	Male	Female
Age group in years		
30–39	0.4 (0.0–0.8)	1.9 (1.0–2.7)
40–49	1.6 (0.8–2.4)	3.8 (2.6–4.9)
50–59	7.7 (5.8–9.6)	12.5 (10.2–14.8)
60–69	9.6 (7.0–12.2)	15.3 (12.2–18.4)
70–79	10.3 (7.1–13.6)	14.8 (11.5–18.2)
80+	10.6 (5.3–15.8)	12.7 (8.6–16.7)
Center		
St. John's, Newfoundland	2.2 (0.0–5.2)	2.7 (0.0–5.9)
Halifax, Nova Scotia	4.1 (1.5–6.7)	5.8 (2.8–8.7)
Quebec City, Quebec	3.3 (2.1–4.4)	8.0 (6.3–9.7)
Kingston, Ontario	2.8 (0.0–7.2)	5.9 (0.0–11.8)
Toronto, Ontario	4.4 (3.2–5.5)	6.9 (5.5–8.3)
Hamilton, Ontario	3.1 (0.5–5.7)	7.5 (3.7–11.3)
Saskatoon, Saskatchewan	6.0 (3.0–9.0)	8.2 (4.9–11.5)
Calgary, Alberta	5.5 (3.1–7.8)	10.2 (7.1–13.3)
Vancouver, British Columbia	8.6 (6.1–11.1)	13.0 (10.1–15.8)
Education*		
<Grade 9	2.6 (0.3–4.8)	11.1 (7.3–14.8)
Grade 9–13, No Diploma	4.4 (2.7–6.2)	11.6 (9.1–14.2)
High School Diploma	3.5 (1.9–5.0)	7.8 (5.8–9.8)
Trade/Professional Diploma	4.0 (2.6–5.3)	10.0 (7.9–12.0)
University without Diploma	3.3 (1.3–5.4)	5.7 (3.4–8.0)
University with Diploma	7.6 (3.8–11.5)	4.6 (2.1–7.0)
University Degree(s)	6.3 (4.9–7.6)	6.2 (4.7–7.8)

*For Education, all references to a diploma were collected as "Certificate or Diploma".

Table III
Glucosamine use and bone or joint disease, using values standardized to the Canadian population. Percentages in the Status columns are based on the total sample. Percentages in the glucosamine use column are based on status of condition (row)

Comorbidity	Men		Women	
	$N = 3667$	$N = 174$	$N = 3985$	$N = 329$
	Status of condition	Glucosamine use	Status of condition	Glucosamine use
	Percent and 95% CI*			
Rheumatoid arthritis or osteoarthritis				
Do not know	0.0 (0.0–0.1)	–	0.1 (0.0–0.3)	–
No	81.6 (80.3–82.8)	3.1 (2.5–3.8)	72.4 (71.0–73.7)	5.2 (4.4–6.1)
Yes, at baseline already	13.1 (12.0–14.2)	13.4 (10.3–16.4)	19.8 (18.6–21.1)	16.6 (14.0–19.2)
Yes, developed since then	5.3 (4.5–6.0)	8.2 (4.4–12.1)	7.7 (6.8–8.5)	15.2 (11.2–19.2)
Osteoporosis				
Do not know	–	–	0.0 (0.0–0.1)	–
No	94.3 (93.6–95.1)	4.6 (3.9–5.3)	85.5 (84.4–86.6)	7.4 (6.6–8.3)
Yes, at baseline already	0.8 (0.5–1.1)	–	4.6 (3.9–5.2)	14.7 (9.5–19.8)
Yes, developed since then	4.9 (4.2–5.6)	9.1 (4.9–13.3)	9.9 (8.9–10.8)	12.2 (9.0–15.5)
Family history of osteoarthritis				
Do not know	6.7 (5.8–7.5)	1.9 (0.2–3.6)	5.0 (4.3–5.7)	8.5 (4.6–12.4)
No	68.5 (67.0–70.0)	4.6 (3.7–5.4)	68.0 (66.6–69.5)	8.0 (7.0–9.1)
Yes	24.9 (23.5–26.3)	6.0 (4.5–7.5)	27.0 (25.6–28.3)	8.7 (7.0–10.4)
Any history of fracture				
Do not know	2.0 (1.5–2.4)	0.2 (0.0–1.3)	1.7 (1.3–2.1)	6.7 (0.7–12.8)
No	75.2 (73.8–76.6)	5.4 (4.6–6.2)	75.0 (73.6–76.3)	8.0 (7.0–8.9)
Yes, at baseline already	21.1 (19.7–22.4)	2.5 (1.4–3.6)	19.1 (17.9–20.4)	8.2 (6.3–10.2)
Yes, fractured since then	1.8 (1.4–2.2)	8.4 (1.7–15.1)	4.2 (3.6–4.9)	13.8 (8.6–19.0)
Ever had back pain				
No	37.9 (36.3–39.4)	4.1 (3.1–5.2)	39.5 (38.0–41.0)	6.3 (5.1–7.5)
Yes	62.1 (60.6–63.7)	5.1 (4.2–6.0)	60.5 (59.0–62.2)	9.5 (8.4–10.7)

Note: Numbers do not always add to totals due to rounding. For women, 0.02% had missing data or refused to respond to the family history question.
*CI = Confidence Interval.

use was much higher in those with than in those without arthritis.

Table IV reports on a multivariable logistic regression model examining factors associated with glucosamine use. The age group of 30–39 years had an insufficient number of glucosamine users to act as a reference group; therefore the age group of 40–49 years was used as the reference category. All age groups had a higher odds ratio (OR) for taking glucosamine as compared to the reference category. All centers had a higher OR for glucosamine use as compared to St. John's, the reference center, although the difference between Kingston and St. John's appears to be small. Participants were also more likely to use glucosamine if they reported a diagnosis of arthritis either at baseline or in the following 5 years, with a somewhat higher likelihood associated with a more recent diagnosis. Those who had experienced back pain at some point, had a higher calcium intake and who engaged in regular physical activity were also more likely to take glucosamine. The strongest determinant of glucosamine use at the 5-year follow-up was glucosamine use at baseline [OR = 4.4; 95% confidence interval (CI) = 3.0–6.5].

Discussion

AGE AND GENDER

Glucosamine use increased substantially over 5 years, particularly among women and with increasing age. Age was included in the final regression model, but gender was not among the best combination of factors associated with glucosamine use, despite the fact that the univariate analysis suggested that women were 1.5 times more likely to take glucosamine as compared to men (95% CI 1.3–1.8). These findings provide some support for previous finding regarding the association between age, gender and CAM use, although the other data are not specific to glucosamine[1,2].

ARTHRITIS AND BACK PAIN

Six hundred and seventy-five men and 1096 women had been told that they had arthritis, either at baseline or in the 5 years since then. From Table III, it is clear that glucosamine use was much higher in these participants than in those who did not have arthritis. These higher rates have been noted in other research[1,6], and would be expected, as glucosamine is primarily marketed for the relief of arthritis symptoms[5–7]. In fact, one of these studies, conducted among patients with osteoarthritis and rheumatoid arthritis, found an even stronger association between arthritis and glucosamine use than our study[6]. However, that study was conducted in a clinic-based population, and thus may have included participants with more severe disease and subsequent higher rates of use. The association between glucosamine use and back pain is consistent with other findings that suggest that CAM and/or glucosamine are commonly used to treat arthritic pain, as well as back pain, back problems, neck pain and joint stiffness, which may be manifestations of arthritic pain[1,5,6,17].

Table IV
Multivariable logistic regression model for glucosamine use

Variable	ORs and 95% CIs
Age group (reference group = 40–49 years)*	
50–59	2.52 (1.43, 4.44)
60–69	3.18 (1.82, 5.55)
70–79	3.21 (1.84, 5.58)
80+	2.50 (1.40, 4.47)
Center (reference group = St. John's, Newfoundland)	
Halifax, Nova Scotia	1.43 (0.96, 2.13)
Quebec City, Quebec	1.86 (1.26, 2.74)
Kingston, Ontario	1.20 (0.80, 1.80)
Hamilton, Ontario	1.60 (1.09, 2.35)
Toronto, Ontario	1.83 (1.22, 2.73)
Saskatoon, Saskatchewan	2.20 (1.51, 3.19)
Calgary, Alberta	2.73 (1.89, 3.94)
Vancouver, British Columbia	3.08 (2.13, 4.44)
Arthritis (reference group = No)	
Yes, at baseline	2.29 (1.94, 2.71)
Yes, developed since baseline	2.90 (2.28, 3.67)
Ever had back pain (reference group = No)	
Yes	1.38 (1.17, 1.64)
Daily calcium intake from supplements, year 5	
For every 300 mg consumed	1.18 (1.13, 1.23)
Regular physical activity (reference group = No)	
Yes	1.26 (1.09, 1.47)
Glucosamine use at baseline (reference group = No)	
Yes	4.42 (3.01, 6.51)

*There were insufficient numbers of glucosamine users in the 30–39 year age group to serve as a reference population.

EDUCATION

For women, glucosamine use decreased as education increased, while for men, there was a small increase with higher levels of education. Published data show mixed results, with some reports reflecting an association between CAM and higher education[1,6], no association with education[5], and an inverse association[2]. Education was not included in the final model, but the univariate results are inconclusive, as the CIs for education were quite wide, with univariate ORs ranging from a low of 1.1 (95% CI 0.8–1.5) for those with a high school diploma, to a high of 1.4 (95% CI 1.1–1.8) for those with a university degree(s).

REGION

Our data also suggest a trend of increased glucosamine use as one moves westward within Canada. Compared to the eastern centers in Newfoundland, Nova Scotia, Quebec and the three Ontario centers, use of glucosamine was higher in the centers located in the Prairie Provinces (Saskatoon and Calgary), with highest usage being reported in the most western center (Vancouver) (Table IV). A similar pattern is seen in the US, where states classified as "West" and "Pacific" had higher rates of CAM use and in particular, BBT use, as compared to the states listed as "Northeast", "Midwest" and "South"[1].

PERSONAL HEALTH MANAGEMENT AND ACTIVITY

Another commonly cited reason for CAM use is that of personal health management, as part of preventive health care rather than as a treatment for illness[4]. In fact, large numbers of Canadians indicated that CAM was useful for maintaining or promoting health (77%), or for treating illness (68%)[4]. There is also evidence to suggest that athletes use products such as glucosamine as preventive management in addition to its use for pain, swelling and arthritis[10]. This may explain the association between participation in regular physical activity and glucosamine use. Those who are physically active may take glucosamine because the activity aggravates conditions such as arthritis, or they may use it prophylactically, to protect against the degenerative changes associated with arthritis.

The concept of using glucosamine prophylactically has received some support from a systematic review that suggests that glucosamine was more effective than placebo in delaying structural progression of knee osteoarthritis[12]. An overview of the treatment strategies for OA also identified several studies that found a beneficial structural effect of glucosamine sulfate[19]. Further information about the ability of glucosamine to delay structural damage of knee OA will be available when the GAIT study releases additional findings later this year[15].

CALCIUM INTAKE FROM SUPPLEMENTS

The association between higher calcium intake from supplements and the use of glucosamine has not been demonstrated in previous research, possibly because much of the previous research was based on survey data where specific details regarding use of other supplements may not have been collected. One possible explanation may be the relatively high use among the participants with osteoporosis in the CaMos sample. While a diagnosis of osteoporosis was not strongly associated with glucosamine use, the univariate analysis presented in Table III does suggest a higher use of glucosamine in those with osteoporosis, particularly among women. These participants are also likely to be taking calcium supplementation, which may have led to the higher calcium intake in glucosamine users. The participants were aware of being in an osteoporosis study, and might therefore be expected to be more aware of calcium and its link to osteoporosis.

A second explanation may involve health promotion, in that those who are taking glucosamine for personal health management may also be eating healthier diets. In fact, there may be two groups of participants who use glucosamine, one that is using it to manage pain and symptoms of arthritis and back pain, and a second that has a healthy lifestyle and takes glucosamine as a preventive measure. This is supported by recent research, which noted that BBT (including glucosamine) were used almost equally for treatment and for prevention[20].

LIMITATIONS

Limitations of the research must be acknowledged. Although the CaMos participants were randomly selected, not all who were invited to participate did so, and those who did not may have differed in some way from those who did agree to participate. Moreover, our data do not allow us to fully explore rural regions. Although the 50-km radius around each urban center included rural areas, the sample did include a much higher proportion of urban compared to rural residents. Close to 20% of the original sample did not provide data at 5 years for a variety of reasons, and those who were still alive but chose not to participate may have differed in important ways, such as illness, from those

who did participate at 5 years. Finally, after 5 years of participating in a study focusing on lifestyle and risk factors for osteoporosis, there may be a study effect in that this cohort may be more aware of their health and take steps to preserve it, as compared to those not in the study. Nevertheless, these data do provide insight into the prevalence of and factors associated with glucosamine use in a population-based sample.

Conclusions

The existing literature suggests that the use of CAM and glucosamine in particular is at an all-time high, and that this trend is likely to continue[1,2,4]. Our data suggest that the use of glucosamine has increased over a 5-year period in a random sample of Canadians, and that this is associated with age, region of Canada, arthritis, back pain, calcium intake, regular physical activity and glucosamine use 5 years earlier. Some may use glucosamine to manage pain and symptoms of arthritis and back pain, while others may use it as a preventive measure to maintain health.

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